

**Report Date:** 19 Dec 2013

**Summary Report for Individual Task  
052-204-2309  
Design Underground Electrical Distribution System  
Status: Approved**

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DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

DESTRUCTION NOTICE: None

**Condition:** As a Power Line Distribution Specialist supervisor in a tactical or nontactical environment in which an underground electrical distribution system is to be designed, you are given DA Form 2702 (Bill of Materials) and the existing distribution/new distribution system load requirements, one-line diagram. This task should not be trained in MOPP.

**Standard:** Design an underground electrical distribution system. Ensure that the designed system is capable of meeting load parameters without exceeding equipment operating limits.

**Special Condition:** None

**Safety Level:** Low

**MOPP:** Never

<b>Task Statements</b>
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**Cue:** None

DANGER

None

WARNING

None

CAUTION

None

**Remarks:** All required Prime Power specific references and technical manuals will be provided by the local Prime Power Command.

**Notes:** None

## Performance Steps

1. Determine the maximum load requirement.
2. Identify the origin of the incoming power source as an isolated power plant, overhead distribution from a power grid, or underground distribution from a power grid.
3. Identify the location and size of each load.
4. Determine the size of the transformers based on the load requirement.
  - a. Calculate ten percent above the maximum load if the load will not increase.
  - b. Oversize the transformers according to the planned expansion if the load is to increase over time.

### 5. Determine Route Selection

Remarks: On long runs, quarter mile increments is recommended for sectionalizers so in the event of a fault, fault locating equipment will be used to its most functional capabilities. This will also help in time of locating and repairing a fault.

- a. Identify points of direction.

Note: Points of direction are transformer locations, tap line locations, locations necessary to maintain radius of bends in cables and locations on long runs to insert testing points for trouble shooting.

- b. Identify utility corridors.

6. Determine the proper placement of the transformers.
  - a. Base the placement on distances between the transformers.
  - b. Base the placement on distances from living and working areas.
  - c. Base the placement on voltage drop calculations.

7. Determine the size of the conductors.
  - a. Base the size on amperage required for set loads.
  - b. Base the size on transformer output if the load is expected to increase.
  - c. Base the size on the type of conductor to be used.
  - d. Base the size on voltage drop calculations.

Note: Always use the lowest values given for that conductor when determining cable sizing if the cable type and manufacturer are unknown.

8. Create a distribution system, one-line or wiring diagram.
9. Prepare a materials takeoff list, taking into account the total quantity of items to be installed, include the following items as a minimum.
  - a. Switchgear.
  - b. Protective devices.

- c. Control wiring, metering, and relays.
  - d. Conduit and cable lengths.
  - e. Concrete pads.
  - f. Insulators.
  - g. Capacitor banks.
  - h. Transformers.
  - i. Mounting hardware.
  - j. Lightning arrestors.
  - k. Grounding materials.
10. Complete DA Form 2702.
- a. Complete the heading with current organization information.
  - b. Record the stock or part number.
  - c. Record the name/description of the item.
  - d. Record the unit of issue.
  - e. Record the total quantity of each item.
  - f. Submit the completed DA Form 2702 for the items to be ordered.
11. Request a review by the prime power supervisor.
12. Submit the design to the power station sergeant or the customer.

(Asterisks indicates a leader performance step.)

**Evaluation Guidance:** Score the Soldier GO if all performance measures are passed (P).  
Score the Soldier NO GO if any performance measure is failed (F).  
If the Soldier scores NO GO, show the Soldier what was done wrong and how to do it correctly.

**Evaluation Preparation:** Provide the Soldier with the items in the conditions. Give the Soldier a safety briefing before starting, and ensure that all safety precautions are followed. Prepare area and equipment in advance to ensure that the task standards can be met.

PERFORMANCE MEASURES	GO	NO-GO	N/A
1. Determined the maximum load requirement.			
2. Identified the origin of the incoming power source as an isolated power plant, overhead from a power grid, or underground distribution from a power grid.			
3. Identified the location and size of each load.			
4. Determined the size of the transformers based on the load requirement.			
5. Determined route selection.			
6. Determined the proper placement of the transformers.			
7. Determined the size of the conductors.			
8. Created a distribution system, one-line or wiring diagram.			
9. Prepared a materials takeoff list, taking into account the total quantity of items to be installed.			
10. Completed DA Form 2702.			
11. Requested a review by the prime power supervisor.			
12. Submitted the design to the power station sergeant or the customer.			

#### Supporting Reference(s):

Step Number	Reference ID	Reference Name	Required	Primary
	DA FORM 2702	Bill of Materials	Yes	No
	LCH	The Lineman's and Cableman's Handbook, 11th Edition, McGraw-Hill. 2007	No	No
	NFPA 70®	National Electrical Code® (NEC®) Handbook. 2011 edition	No	No
	TM 5-811-1	Electric Power Supply and Distribution {AFJMAN 32-1080}	No	No
	TM 5-811-3	Electrical Design: Lightning and Static Electricity Protection. AFM 88-9, Chap 3.	No	No
	UGLYS™	Ugly's Electrical References. 2005	No	No

**Environment:** Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to FM 3-34.5 Environmental Considerations and GTA 05-08-002 ENVIRONMENTAL-RELATED RISK ASSESSMENT. Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to FM 3-34.5 Environmental Considerations and GTA 05-08-002 ENVIRONMENTAL-RELATED RISK ASSESSMENT.

**Safety:** In a training environment, leaders must perform a risk assessment in accordance with FM 5-19, Risk Management. Leaders will complete a DA Form 7566 COMPOSITE RISK MANAGEMENT WORKSHEET during the planning and completion of each task and sub-task by assessing mission, enemy, terrain and weather, troops and support available-time available and civil considerations, (METT-TC). Note: During MOPP training, leaders must ensure personnel are monitored for potential heat injury. Local policies and procedures must be followed during times of increased heat category in order to avoid heat related injury. Consider the MOPP work/rest cycles and water replacement guidelines IAW FM 3-11.4, Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection, FM 3-11.5, Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination. All safety considerations are mentioned in the task performance steps and are annotated as DANGERS, CAUTIONS and WARNINGS. A thorough risk assessment must be completed prior to every mission or operation.

**Prerequisite Individual Tasks :** None

**Supporting Individual Tasks :**

<b>Task Number</b>	<b>Title</b>	<b>Proponent</b>	<b>Status</b>
052-204-1205	Install Underground Cable	052 - Engineer (Individual)	Approved
052-204-2211	Develop a Bill of Materials (BOM) List	052 - Engineer (Individual)	Approved
052-204-2217	Manage a Power Line Crew	052 - Engineer (Individual)	Approved

**Supported Individual Tasks :** None

**Supported Collective Tasks :**

<b>Task Number</b>	<b>Title</b>	<b>Proponent</b>	<b>Status</b>
05-3-5702	Install Underground Electrical-Power Distribution Equipment	05 - Engineers (Collective)	Approved
05-3-5700	Install Nonstandard Low-Voltage, Electrical-Power Distribution Equipment	05 - Engineers (Collective)	Approved
05-3-5722	Prepare Power Systems Construction Estimates	05 - Engineers (Collective)	Approved
05-3-5724	Install Expedient, Surface-Laid, Electrical-Power Distribution Equipment	05 - Engineers (Collective)	Approved
05-3-5715	Perform Power Plant Design Technical Assistance	05 - Engineers (Collective)	Approved
05-3-5701	Install Low-Voltage, Electrical-Power Distribution Equipment	05 - Engineers (Collective)	Approved
05-3-5728	Assess Power Generation Systems for Damage	05 - Engineers (Collective)	Approved
05-3-5723	Install Prime Power Generation Equipment	05 - Engineers (Collective)	Approved
05-3-5727	Install Underground Distribution Equipment	05 - Engineers (Collective)	Approved

**ICTL Data :**

<b>ICTL Title</b>	<b>Personnel Type</b>	<b>MOS Data</b>
12Q30, Power Line Distribution Specialist, skill level 3	Enlisted	MOS: 12Q, Skill Level: SL3